

## FACT SHEET

### ISSUANCE OF A GENERAL VPDES PERMIT FOR DISCHARGES FROM PETROLEUM CONTAMINATED SITES AND HYDROSTATIC TESTS

The Virginia State Water Control Board has under consideration the issuance of a general permit for discharges from petroleum contaminated sites and for discharges associated with hydrostatic testing. This general permit will replace the General VPDES Permit for Discharges from Petroleum Contaminated Sites, VAG83, which expires February 25, 2003. Owners covered under the expiring general permit, who wish to continue to discharge under a general permit, must register for coverage under the new general permit.

Permit Number: VAG83

Name of Permittee: Any owner in the Commonwealth of Virginia agreeing to be regulated under the terms of this general permit.

Facility Location: Commonwealth of Virginia

Receiving Waters: Surface waters within the boundaries of the Commonwealth of Virginia, except waters specifically named in Board Regulations or Policies which prohibit such discharges.

On the basis of preliminary review and application of lawful standards and regulations, the State Water Control Board proposes to issue the general permit subject to certain conditions and has prepared a draft permit. The Board has determined that this category of discharges is appropriately controlled under a general permit. The category of discharges to be included involves facilities with the same or similar types of operations and the facilities discharge the same or similar types of wastes. The draft general permit requires that all covered facilities meet standard effluent limitations, conditions and monitoring requirements.

Persons may comment in writing on the proposed issuance of the general permit within 60 days from. Comments should be addressed to the contact person listed below. Comments shall include the name, address, and telephone number of the writer, and shall contain a complete, concise statement of the factual basis for comments. Only those comments received within this period will be considered by the Board.

All pertinent information is on file and may be inspected, and arrangements made for copying by contacting Jon van Soestbergen at:

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P.O. Box 10009  
Richmond, Virginia 23240  
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A public hearing will be held on this draft permit. Notice of the public hearing will be published in newspapers and in the Virginia Register. Following the public hearing comment period, the Board will make its determinations regarding the proposed issuance.

### Activities Covered By This General Permit

Petroleum contamination can occur as a result of leaks from above ground or underground storage tanks, pipeline leaks, surface oil spills and poor housekeeping at facilities that handle petroleum products. When the structural integrity of storage tanks or pipelines is tested with water pressure, the water may become contaminated with petroleum products. For the purposes of this general permit, "petroleum products" means petroleum-based substances comprised of a complex blend of hydrocarbons derived from crude oil such as motor fuels, jet fuels, distillate fuel oils, residual fuel oils, lubricants, petroleum solvents and used oils. Petroleum products does not include hazardous waste as defined by the Virginia Hazardous Waste Regulations, 9 VAC 20-60-10 et seq.

Contaminants may be introduced into surface waters when potable, or non-potable waters are used to hydrostatically test new or repaired petroleum or natural gas pipelines or petroleum storage tanks. These tests are commonly done in the pipeline industry and even though the events are usually sporadic in nature, they may produce a discharge significant in volume. Therefore, a general permit would adequately govern this type of activity.

This general permit will cover point source discharges of pollutants to surface waters resulting from petroleum contaminated sites. The following specific activities are covered: excavation dewatering, bailing ground water monitoring wells, ground water pump tests to characterize site conditions, hydrostatic testing of petroleum storage tanks or pipelines, ground water pumping associated with petroleum product recovery, or discharges resulting from another petroleum product cleanup approved by the Department.

The effluent limits in the proposed general permit are established according to the type of petroleum product causing the contamination and the nature of the waterbody receiving the discharge. Due to U.S. EPA concerns for impacts on threatened and endangered species, the permit will not consider less stringent effluent limits for discharges that occur within a period of 72 consecutive hours and occurring at least 3 years apart.

### Proposed Effluent Limitations and Monitoring Requirements

Discharges Contaminated with Gasoline  
Freshwater Receiving Water body

<u>Parameter</u>	<u>Limitation</u>
Flow	No limit, monitoring required
Benzene	50 ug/l instantaneous max.
Toluene	175 ug/l instantaneous max.
Ethylbenzene	320 ug/l instantaneous max.
Total Xylenes	82 ug/l instantaneous max.
Total Recoverable Lead <sup>1</sup>	$e^{(1.273(\ln \text{hardness})) - 4.705}$
Hardness <sup>2</sup>	mg/l, no limit
pH	6.0 inst. min.- 9.0 inst. max.
MTBE	1840 ug/l

<sup>1</sup> Monitoring this parameter is required only when contamination results from leaded fuel.

<sup>2</sup> Monitoring effluent hardness is required only when contamination results from leaded fuel. Hardness is needed to determine the lead effluent limit. The minimum hardness that may be used to derive the lead effluent limit is 25 mg/l.

Discharges contaminated with petroleum products other than gasoline:  
Freshwater Receiving Water Body

<u>Parameter</u>	<u>Limitation</u>
Flow	No limit, monitoring required
Naphthalene	62 ug/l instantaneous max.
Total Petroleum Hydrocarbons	15 mg/l instantaneous max.
pH	6.0 inst. min. - 9.0 inst. max.
Semi-volatile Organics <sup>3</sup>	No limit, monitoring required
Volatile Organics <sup>3</sup>	No limit, monitoring required
Dissolved Metals <sup>3</sup>	No limit, monitoring required

Saltwater Receiving Water body;

Discharges contaminated with gasoline:

<u>Parameter</u>	<u>Limitation</u>
Flow	No limit, monitoring required
Benzene	50 ug/l instantaneous max.
Toluene	500 ug/l instantaneous max.
Ethylbenzene	4.3 ug/l instantaneous max.
Total Xylenes	74 ug/l instantaneous max.
Total Recoverable Lead <sup>1</sup>	8.5 ug/l instantaneous max.
pH	6.0 inst. min. - 9.0 inst. max.
MTBE	440 ug/l instantaneous max.

Saltwater Receiving Water body

Discharges contaminated with petroleum products other than gasoline:

<u>Parameter</u>	<u>Limitation</u>
Flow	No limit, monitoring required
Naphthalene	23.5 ug/l instantaneous max.
Total Petroleum Hydrocarbons	15 mg/l instantaneous max.
pH	6.0 inst. min. - 9.0 inst. max.
Semi-volatile Organics <sup>2</sup>	No limit, monitoring required
Volatile Organics <sup>2</sup>	No limit, monitoring required
Dissolved Metals <sup>2</sup>	No limit, monitoring required

All monitoring is required to be conducted by grab samples collected monthly, except semi-volatile organics, volatile organics and heavy metals which are monitored annually.

<sup>1</sup> Monitoring this parameter is required only when contamination results from leaded fuel.

<sup>2</sup> Monitoring for these parameters is required only when contamination results from used oils.

All Receiving Waters  
Hydrostatic Test Discharges

<u>Parameter</u>	<u>Limitation</u>
Flow	NL
pH	6.0 to 9.0 standard units
Total Petroleum Hydrocarbons (TPH)	15 mg/l instantaneous max
Total Organic Carbon (TOC)	NL
Total Suspended Solids (TSS)	NL
Total residual chlorine (TRC)	.011 mg/l instantaneous max

Other Permit Conditions

The general permit prohibits discharge of floating solids or visible foam in other than trace amounts.

A condition is proposed in order to clarify the requirement for reporting of effluent monitoring results. Discharge monitoring is required each month in which a discharge occurs. For months when no discharge occurs, the permittee must submit a DMR certifying that there was no discharge. This system will allow DEQ to verify that either the effluent met the permit limits or that there was no discharge during the month.

Permittees that discharge treated wastewater are required to develop an Operations and Maintenance manual for the permitted treatment works. This requirement is imposed to assure proper operation and maintenance of facilities discharging under the general permit.

In order to assure that the proposed cleanup is conducted according to the methods in the approved Registration Statement, the permittee must construct treatment works prior to discharging and the permittee must notify the Department within 5 days of commencement of operation.

The general permit contains a condition designed to prevent pollution from materials stored on the site, which are not otherwise controlled by the effluent limitations.

If the proposed discharge is to surface waters via a municipal storm sewer system, the general permit requires the permittee to notify the owner of the storm sewer system. This is required in order to facilitate the municipality's efforts to control dry weather flows from the storm sewer.

A request for termination of coverage under the permit is required to provide documentation for the permittee and the Department that the activities covered under the general permit have been concluded and coverage is no longer needed.

The general permit anticipates that the covered treatment works will not be treating sewage from other users or indirect dischargers. Therefore, the permit contains no conditions applicable to such users.

## Revisions to Expiring VPDES General Permit for Petroleum Contaminated Sites

Wastewater from the hydrostatic testing of natural gas and petroleum pipelines and storage tanks have been added to this general permit. The bases for effluent limits from these discharges are discussed below.

Effluent limits for methyl tertiary butyl ether (MTBE) have been revised. The bases for these changes are discussed below.

Analytical methods specified in the permit for certain constituents have been changed to reflect the latest techniques available for detecting these constituents.

## Basis for Effluent Limitations - Discharges of Gasoline Contaminated Water

This general permit contains both technology-based and water quality-based effluent limits. Where both types of limits were available, the more stringent of the two was chosen. The U.S. EPA has developed a model NPDES permit for discharges from gasoline contaminated underground storage tank sites. The model permit provides technology-based effluent limitations for surface water discharges. The technology basis for those limitations is free product removal followed by air stripping. The limits are set for benzene and the sum of benzene, toluene, ethylbenzene, and xylenes (BTEX). These parameters are used as indicators of the compounds most likely to be found in gasoline. Benzene is considered a good indicator of the removal of volatile organic gasoline constituents via air stripping because of its relatively high water solubility and low volatility compared to other gasoline components.

The EPA model permit states that air strippers have the potential to operate at 99.5% efficiency and it uses this as the basis for limitations on benzene and BTEX. However, it also states that one cannot assume optimal operational conditions at all times and that permit limitations must be achievable with existing technology at reasonable cost. The model permit then establishes optional limitations based on 95% removal efficiency. The 95 percent efficiency rating accounts for operational difficulties which may be encountered during periods of low temperature and/or high humidity when air strippers may not be expected to perform at the 99.5% peak efficiency level. The EPA Treatability Database (RREL Version 5.0) contains information on treatment of the BTEX compounds at various concentrations by air stripping and granular activated carbon. The average removal efficiencies in contaminated ground water are as follows: benzene 97%, toluene 97.4%, ethylbenzene 87% and xylene 88%. The 95% removal efficiency also provides the possibility for considerable cost savings for the tank owners/operators involved in cleaning up underground storage tank (UST) sites, many of whom are small businesses without the resources to install state-of-the-art equipment. The number of sites cleaned up under the Virginia Petroleum Storage Tank Fund would also increase if the cost per site were less.

The technology-based benzene limit of 50 ug/l in the EPA model permit is derived by assuming a concentration of 1 mg/l benzene in the influent to the treatment system and 95% removal. Thus, the technology-based limitations of 50 ug/l in this general permit are based on the 95% removal efficiency assumption allowed in the EPA model permit.

The water quality-based effluent limitations in this general permit are established pursuant to the VPDES Permit Regulation, 9 VAC 25-31-220 D, and the policy stated in the Virginia Water Quality Standards, 9 VAC 25-260-140 B. The limits are set at what are believed to be safe concentrations for the protection of beneficial uses including the growth and propagation of aquatic organisms inhabiting surface waters which

receive the discharge. They assume zero dilution of the effluent by the receiving waters so that they can be applied without regard to effluent or receiving water flows. They are based on information provided in EPA criteria documents for priority pollutants, EPA toxicity databases and conservative application factors.

The aggregate parameter BTEX is used in the EPA model NPDES permit previously discussed to limit 4 parameters. It sets an effluent limitation for BTEX at 750 ug/l based on an assumed influent BTEX concentration of 15 mg/l and the 95% air stripper removal efficiency. The model permit document states that the composition of gasoline is highly variable and any one of the four BTEX components may be the primary constituent. The discussion of water quality-based limits which follows identifies cases where the 750 ug/l technology-based limitation on BTEX would not protect aquatic life from adverse effects.

In some circumstances, if a specific BTEX component were to dominate the mixture the resulting effluent could be toxic at, or below, 750 ug/l. For instance, Thomas and Delfino (1991) found that toluene comprises about 50% of the total BTEX in gasoline when analyzed by EPA Methods 610 and 602. If the BTEX limit were set at 750 ug/l then this could allow up to 375 ug/l of toluene in an effluent. The discussion on water quality-based limits which follows sets a limit of 175 ug/l for toluene in discharges to freshwater. The same researchers found that xylenes made up about 30% of the total BTEX in gasoline. When applied to the 750 ug/l BTEX limit in the EPA model permit this results in a possible xylene discharge level of 225 ug/l. Based on available information, total xylenes should not exceed 82 ug/l in freshwater. Without limits on individual parameters, ethylbenzene in discharges to saltwater could still be chronically toxic at the 100 ug/l BTEX technology-based limit given in the model permit using 99.5% removal efficiency.

Based on this discussion, the general permit does not contain a technology-based BTEX limit. Instead, it establishes water quality-based limits on the individual components (benzene, toluene, ethylbenzene and total xylenes), which result in lower total BTEX levels in the discharge. When the proposed limits for individual components are summed, the BTEX value for the freshwater discharges is 627 ug/l and for discharges to saltwater the value is 628.3 ug/l.

### **Benzene**

The EPA criteria document for benzene (EPA 440/5-80-018) states that benzene may be acutely toxic to freshwater organisms at concentrations as low as 5,300 ug/l. This is an LC50 value for rainbow trout. The document also states that acute toxicity would occur at lower concentrations among more sensitive species. No data were available concerning the chronic toxicity of benzene to sensitive freshwater organisms. The derivation of a "safe level" for benzene was based on the 5,300 ug/l LC50. This value was divided by 10 in order to approximate a level which would not be expected to cause acute toxicity. (The use of an application factor of 10 was recommended by the National Academy of Sciences in the EPA's publication "Water Quality Criteria, 1972" (EPA/R3/73-033). This use of application factors when setting water quality criteria is still considered valid in situations where data are not sufficient to develop criteria according to more recent guidance.) The resulting "non-lethal" concentration of 530 ug/l was divided by an assumed acute to chronic ratio of 10 to arrive at the water quality-based permit limitation of 53 ug/l. (When actual data are not available, EPA, in the Technical Support Document for Water Quality-based Toxics Control (EPA/505/2-90-001) recommends using an acute to chronic ratio of 10). The EPA model permit's technology-based 50 ug/l value is more protective, therefore, it was chosen over the 53 ug/l water quality-based concentration.

The limited data for benzene and saltwater organisms in the EPA criteria document indicates that stress and survival effects occur at concentrations as low as 700 ug/l when fish are exposed for long periods. Based on

the application of a 0.10 safety factor to this chronic effect concentration, the water quality-based limit for discharges to saltwater streams would be 70 ug/l. Once again, the 50 ug/l technology-based limitation is recommended because it is attainable and more protective.

### **Ethylbenzene**

The EPA criteria document for ethylbenzene (EPA 440/5-80-048) gives an acute effects concentration of 32,000 ug/l. This is an LC50 for bluegill sunfish. Acute toxicity may occur at lower concentrations if more sensitive species were tested. No definitive data are available on the chronic toxicity of ethylbenzene to freshwater organisms. In order to derive an acceptable level of ethylbenzene for the protection of freshwater organisms the acute value of 32,000 ug/l was divided by 100, using the same assumptions employed above for benzene. The resulting value of 320 ug/l is the proposed freshwater effluent limit for ethylbenzene.

According to the criteria document, ethylbenzene is acutely toxic to certain saltwater organisms at concentrations as low as 430 ug/l and may be acutely toxic at lower concentrations if more sensitive organisms are tested. Dividing this number by the 100 application factor yields the proposed effluent limit of 4.3 ug/l for discharges to saltwater receiving waters.

The Virginia human-health water quality standards for ethylbenzene are 3,100 ug/l and 29,000 ug/l for drinking and non-drinking waters, respectively. The proposed effluent limits based on aquatic toxicity are more stringent than human-health based standards and should be protective of human health concerns.

### **Toluene**

The EPA criteria document for toluene (EPA 440/5-80-075) states that acute toxicity to freshwater organisms occurs at 17,500 ug/l and would occur at lower concentrations if more sensitive organisms were tested. No data are available on the chronic toxicity of toluene to freshwater species. Based on the available data for acute toxicity and dividing by the application factor of 100, the proposed effluent limit for toluene discharged to freshwater is 175 ug/l.

The available data indicate that toluene is chronically toxic to certain saltwater organisms at concentrations as low as 5,000 ug/l. Chronic toxicity levels are expected to occur at lower concentrations if more sensitive organisms are tested. Dividing this chronic effects level by 10 resulted in the proposed saltwater discharge effluent limit of 500 ug/l.

The Virginia human health standards for toluene in drinking and non-drinking water streams are 6,800 ug/l and 200,000 ug/l, respectively. The proposed effluent limits based on aquatic toxicity are more stringent than human health based standards and should be protective of human health.

### **Xylene**

Xylene is not a 307(a) priority pollutant, therefore no criteria document exists for this compound. There are three isomers of xylene (ortho, meta and para) and the general permit limits are established so that the sum of all xylenes is considered in evaluating compliance. The proposed effluent limits are based on a search of the EPA's AQUIRE data base.. According to AQUIRE, the lowest freshwater LC50 for xylenes is 8,200 ug/l

reported for rainbow trout. Based on the rationale presented earlier for other compounds, this acutely toxic concentration was divided by 10 to account for species that were not tested but which may be more sensitive than rainbow trout. Then, in order to find a concentration that is expected to be safe over chronic exposures, an additional safety factor of 10 was applied to arrive at the proposed effluent limitation of 82 ug/l total xylenes.

Since the general permit was first issued in 1993, EPA has revised the AQUIRE database to add new information and delete data that did not meet their quality assurance requirements. When the saltwater limit for total xylenes was originally developed, the lowest LC50 for saltwater species in the database was 1,300 ug/l for bay shrimp. A recent review of AQUIRE showed that this test has been deleted. The LC50 of 7,400 ug/l for grass shrimp is now the lowest saltwater value in the database. Once again, the LC50 was divided by 100 to derive the effluent limit of 74 ug/l total xylenes. Although this new limit is less stringent than the previous limit, it is allowed under the exceptions to the anti-backsliding provisions of the VPDES Permit Regulation because it is based on new information that was not available at the time the original permit was issued (9 VAC 25-31-220 L 2 b (1)).

There is no Virginia human health water quality standard for xylenes. The Maximum Contaminant Level and Maximum Contaminant Level Goal for xylenes in the EPA Safe Drinking Water Regulation, 40 CFR Part 141, are both set at 10 mg/l. The proposed permit limits based upon aquatic toxicity are more stringent than drinking water standards for xylenes and are expected to be protective of human health.

### **Lead**

The EPA permit model for discharges of petroleum contaminated water does not contain a recommended effluent limit for lead. It is recognized that tetraethyl and tetramethyl lead may be present in gasoline at leaking storage tank sites. These organic lead compounds, if present, are expected to be removed via air stripping along with other volatile organics.

The proposed effluent limits for lead are based upon the Virginia Water Quality Standards for chronic protection of fresh and saltwater organisms. While the water quality standards require analysis for dissolved metals, this permit requires that samples be analyzed for Total Recoverable Lead as required by the Virginia Pollutant Discharge Elimination System (VPDES) Permit regulation 9 VAC 25-31-230C. The chronic standard for lead in saltwater when the general permit regulation was initially adopted was 8.5 ug/l. Less stringent water quality criteria were adopted by the Board on September 25, 1997. The lead standard for saltwater used in the existing general permit, however, cannot be revised due to anti-backsliding requirements and the effluent limit for lead discharged into saltwater must remain at 8.5 ug/l.

Virginia's freshwater lead standard for the chronic exposure of organisms to this constituent is based upon the hardness of the water in the waste stream. The lead standard for chronic toxicity to freshwater aquatic organisms is now calculated by equation 1 (Virginia Water Quality Standard Regulation, adopted September 25, 1997). The freshwater lead standard in the present general permit is more stringent than the lead standard in the 1997 Water Quality Standard Regulation and is calculated from equation 2. Equation 2 was taken from the freshwater lead standard for chronic toxicity listed in Virginia's 1992 Water Quality Standard Regulation (VR 680-21-00).

$$(1) \quad e^{(1.273(\ln \text{ hardness})) - 3.259}$$



$$(2) \quad e^{(1.273(\ln \text{ hardness})) - 4.705}$$

Due to antibacksliding considerations, the permit must continue to base effluent limits for lead on equation 2. The 1992 Water Quality Standard Regulation stipulated that the minimum hardness concentration that may be used to calculate the lead standard was 25 mg/l. The lead effluent limit in the VPDES General Permit for Petroleum Contaminated Sites (effective February 24, 1998), however, failed to specify a minimum hardness that could be used when calculating the lead effluent limit and this appears to have been an oversight. The DEQ recommends using equation 2 to derive the lead limit for discharges into freshwaters. In accordance with the 1992 Water Quality Standard Regulation, the permit also will specify that 25 mg/l is the minimum hardness that may be used to derive the lead standard.

### **Methyl Tertiary Butyl Ether**

Methyl-tert-butyl ether (MTBE) is a common additive in "reformulated" automotive gasolines. This oxygenate is supposed to reduce winter-time carbon monoxide levels in U.S. cities. It also is believed to be effective in reducing ozone and other toxics in the air year-round. If MTBE is used, it can be present in gasoline at up to 15% of the volume of the fuel. MTBE is an extremely hydrophilic compound. Unlike most petroleum products, it readily dissolves in water. The presence of MTBE in gasoline can increase the solubility of the fuel mixture in groundwater. MTBE may be removed from contaminated ground water by air stripping treatment technologies. However, due to its hydrophilic nature, a higher air/water ratio is required to remove this constituent via air stripping than is required for BTEX removal. According to the EPA Treatability Database (RREL Version 5.0), MTBE removal efficiency via air stripping ranges from approximately 63 percent to 79 percent. If the MTBE concentration in the system influent is 10 mg/l and removal efficiency of 75 percent is achieved, air stripping should be capable of reducing the MTBE concentration to 2.5 mg/l.

Neither EPA nor the DEQ has established water quality criteria for MTBE for protection of aquatic life or human health. Literature searches indicated several studies that evaluated the effects of MTBE on aquatic organisms. According to BenKinney et al. (1994), MTBE was acutely toxic (LC50) to green algae (*Selanastrum capricornutum*) at a concentration of 184,000 ug/l. Geiger and associates (1988) found that MTBE was acutely toxic to the fathead minnow (*Pimephales promelas*) at a concentration of 672 mg/l (672,000 ug/l). Application of the customary safety factor of 100 to the LC50 concentration for green algae results in a concentration of 1,840 ug/l. This concentration is recommended as the discharge limit for MTBE into freshwater.

The literature search revealed several studies performed on the toxicity of MTBE to marine organisms. BenKinney et al. (1994) found that MTBE was acutely toxic to the inland silverside (*Menidia beryllina*) at a concentration of 574 mg/l. According to Boeri and associates (1994), MTBE was acutely toxic to mysid shrimp (*Mysidopsis bahia*) at 44 mg/l (44,000 ug/l). Application of the customary safety factor of 100 to the LC50 for the mysid shrimp results in a concentration of 440 ug/l. An concentration of 440 ug/l is recommended as the effluent limit for MTBE discharged into saltwater.

### **pH**

The pH limits in this general permit are based on the Virginia Water Quality Standards and range from a low of six (6) standard units to nine (9) standard units.

## Effluent Limitations - Discharges of Petroleum Products other than Gasoline

The EPA model permit for UST remediation sites only addresses gasoline contaminated sites. This general permit is also designed to be used at sites which are contaminated by petroleum products other than gasoline (non-gasoline motor fuels, jet fuels, distillate fuel oils, residual fuel oils, lubricants, petroleum solvents and used oils). In addition to containing small amounts of the volatile organic compounds such as benzene, these products contain more of the polynuclear aromatic hydrocarbons (PAHs) than are found in gasoline. PAHs are less soluble in water than the volatile compounds and they are less amenable to air stripping. It is possible that a treatment system that is capable of removing the volatile compounds like benzene to acceptable levels may not effectively remove the PAHs. Based upon the types and relative proportions of the constituents present in the non-gasoline petroleum products, benzene and the BTEX constituents are not good indicator parameters to use in evaluating the quality of effluents from sites contaminated with this category of petroleum.

### **Naphthalene**

The effluent limitation for naphthalene proposed in this general permit is a water quality-based limit. It is to be applied at sites where contamination is from diesel or other fuels that are not classified as gasoline. Naphthalene is a component of gasoline and non-gasoline petroleum products, but its relative concentration is higher in products such as diesel and kerosene than in gasoline (Thomas & Delfino, 1991). It is less soluble in water than benzene (solubility 30 mg/l vs 1780 mg/l) and is less amenable to air stripping (Henry's Law Constant  $4.83 \times 10^{-4}$  vs  $5.55 \times 10^{-3}$  @ 25°C). These characteristics make the treatability of naphthalene more similar to that of the heavier PAH components than the BTEX compounds.

PAHs in general are relatively insoluble in water. For instance, the solubilities of the typical petroleum PAHs anthracene, phenanthrene and fluorene are 1.29 mg/l, 0.8 mg/l and 1.9 mg/l, respectively. These compounds are more likely to be found in free product or adsorbed onto soils at a petroleum contaminated site rather than dissolved in ground water. As a moderately soluble compound, naphthalene is more likely to dissolve in ground water and migrate from the source of contamination. Therefore, it occupies an intermediate position between the volatile BTEX compounds and the less soluble PAHs. By selecting naphthalene as the indicator parameter for this category of contaminated sites, the general permit relies on the assumption that if naphthalene has been removed to acceptable levels, then the BTEX components of the petroleum should have been removed and the heavier PAHs associated with the contamination should have either remained in the soils at the source or been reduced to an acceptable level with the treatment for naphthalene.

The limited data available in the EPA Treatability Database indicate that treatment with granular activated carbon (GAC) filtration is more effective in removing naphthalene and other PAHs than is air stripping. Although this general permit does not mandate a treatment technology, the low solubility of PAHs makes them amenable to treatment by GAC filtration of the contaminated ground water.

The EPA criteria document for naphthalene (EPA 440/5-80-059) gives a chronic effect concentration of 620 ug/l with fathead minnows, but it states that effects would occur at lower concentrations if more sensitive freshwater organisms were tested. Dividing this chronic effects level by 10 results in the proposed effluent limit of 62 ug/l for discharges into freshwater streams.

There were no data on the chronic effects of naphthalene on saltwater organisms. The lowest observed LC<sub>50</sub>

value in the EPA criteria document was given as 2,350 ug/l, in a test with grass shrimp. This was converted to the proposed effluent limit of 23.5 ug/l for discharges to saltwater by dividing by 100.

There is no Virginia human health water quality standard for naphthalene.

### **Total Petroleum Hydrocarbons**

The general permit proposes a technology-based limit of 15 mg/l for the parameter Total Petroleum Hydrocarbons (TPH). This limit is applicable for discharges where the contamination is from petroleum products other than gasoline. It is based on the ability of simple oil/water separator technology to recover free product from water. Wastewater that is discharged without a visible sheen is generally expected to meet this effluent limitation. Monitoring data generated during the term of general permit VAG000002 indicates that effluents are generally below this level. DEQ has utilized an effluent limitation of 15 mg/l oil & grease for many years in individual permits for potential sources of petroleum hydrocarbons. Recently, the DEQ determined that the oil & grease analytical method is better suited for detection of animal and vegetable fats rather than petroleum. Therefore, the parameter TPH is being limited in the general permit rather than oil & grease.

The term "used oils" is used in the general permit to refer to those petroleum products that have served their useful purpose and have been collected for recycling or disposal. Tanks that store used oils are found at industrial sites and at automotive service stations. These tanks have the potential to leak into surrounding soils and contaminate ground water. The materials in used oil storage tanks can be a mixture of motor oils and other petroleum products, as well as solvents or other organic chemicals. Used oils also may contain dissolved metals derived from the machinery from which the oil was recovered. These mixtures pose potential environmental impacts that may not be adequately addressed by the pollutant parameters established to control discharges from the sites contaminated by products other than gasoline. Therefore, the general permit proposes to require that when the contamination is from used oils, additional monitoring shall be conducted to scan the wastewater for a wide range of organic compounds and metals. This information will be evaluated and a decision on the need for additional limits on discharges of this type will be made prior to the expiration date of the general permit. In no case will the general permit allow a discharge of wastewaters if the contamination is from used oils that are classified as hazardous materials according to the Virginia Hazardous Waste Regulation, 9 VAC 20-60-10 et seq.

### **Basis for Effluent Limits - Hydrostatic Discharges from Hydrostatic Testing of Pipelines and Tanks**

In the past, discharges of hydrostatic test waters were not covered by a permit. This was largely due to the amount of time necessary to issue individual permits and limited staff resources. When this permit was reissued in 1998, hydrostatic test waters from petroleum facilities were included so that a VPDES permit could properly govern them. With this reissuance, discharges from hydrostatic testing of natural gas pipelines are being included so that a VPDES permit too may properly govern them.

Natural gas, like other petroleum products, is not constant in its composition or the relative proportions of individual constituents within that product. According to Technocarb (2002), methane typically makes up approximately 95 percent of natural gas by volume. Ethane and propane generally make up approximately two and one percent of the gas, respectively. Other constituents that typically make up the remaining two percent of the mixture include butane, carbon dioxide, and nitrogen. There is no aquatic or human toxicity

data for these compounds.

Discharges from hydrostatically testing pipelines are generally one-time occurrences of less than 48 hours. Such frequencies and durations preclude the necessity for application of toxic parameters except for total residual chlorine (TRC). TRC is potentially present in high concentrations when treated potable water is used as the source water for testing. Discussion of the recommended effluent limits for discharges of hydrostatic test water from natural gas pipelines is presented below. In addition to the effluent limits, the following requirements will also apply to hydrostatic discharges from natural gas pipelines:

1. The equipment being tested shall be substantially free of debris, raw material, product, or other residual materials.
2. The discharge flow shall be controlled in such a manner that prevents flooding, erosion, or excessive sediment influx into the receiving water body.

### **Total Petroleum Hydrocarbons (TPH)**

The limit for TPH is based on the ability of simple oil-water separator technology to recover petroleum from water. Wastewater that is discharged without a visible sheen is generally expected to meet this effluent limitation. DEQ has used this limitation for many individual permits for many years and monitoring data has demonstrated that it is readily achievable. Mass limits are not applicable to this type of pollutant and discharge and are not required.

### **Total Organic Carbon (TOC)**

Total organic carbon (TOC) is monitored to assure that the effluent is not contaminated with non-petroleum organic substances. Staff members generally believe that TOC concentrations in this type of discharge are low. However, should sampling data indicate high levels of TOC, the permit may be modified at a later time to include such a limit.

### **Total Suspended Solids (TSS)**

Total suspended solids (TSS) is monitored to assure that the effluent is not contaminated with excessive amounts of solids that might be flushed out of pipes along with the test waters. If significant concentrations of suspended solids are detected, the permit may be modified at a later time to include a limit.

### **Total Residual Chlorine (TRC)**

Total residual chlorine (TRC) is necessary for those hydrostatic tests that use chlorinated potable drinking water as the source water for testing. The limit is based on the chronic aquatic life criterion in Virginia's water quality standards.

## pH

The pH limits in this general permit are based on the Virginia Water Quality Standards and range from 6 standard units to 9 standard units.

### Administrative

The general permit will have a fixed term of five (5) years effective upon Board approval. Every authorization to discharge under this general permit will expire at the same time and all authorizations to discharge will be renewed on the same date. Discharges will be covered under the general permit upon approval of the Registration Statement and delivery of a copy of the general permit to the applicant.

This general permit does not apply to any new or increased discharge that will result in significant effects to the receiving waters. That determination is made in accordance with the State Water Control Board's Antidegradation Policy contained in the Virginia Water Quality Standards, 9 VAC 25-260-10 et seq. Antibacksliding will also be considered prior to granting coverage under this general permit to operations currently discharging under another VPDES permit or under an existing Corrective Action Plan general permit.

If an applicant for a discharge appears to qualify for this general permit, the applicant will be required to submit a general permit Registration Statement. The Board will review the Registration Statements received and either send a copy of the general permit to those that qualify, or send a copy of the application for an individual permit to those that do not qualify.

### REFERENCES

- Thomas, D.H. and J.J. Delfino. 1991. "A Gas Chromatographic/ Chemical Indicator Approach to Assessing Ground Water Contamination by Petroleum Products." Ground Water Monitoring Review. Fall 1991. pp. 90-100
- BenKinney, M.T., J.F. Barbieri, J.S. Gross, and P.A. Naro. 1994. Aquatic toxicity of methyl-tertiary-butyl ether (MTBE) to aquatic organisms. Presented at the 15<sup>th</sup> Annual SETAC meeting, October 30, 1994. Denver, Co.
- Boeri, R.L., J.P. Magazu and T.J. Ward. 1994. Acute toxicity of methyl tertiary butyl ether to the mysid, *Mysidopsis bahia*. Study No. 424-AR. T.R. Wilbury Laboratories, Inc., MA.
- Geiger, D.L., D.J. Call, and L.T. Brooke. 1988. Acute Toxicities of Organic Chemicals to Fathead Minnows (*Pimephales promelas*), Vol. 4. Center for Lake Superior Environmental Studies, University of Wisconsin, Superior.
- Technocarb. 2002. Web Page for Technocarb Alternative Fuel Power.  
<http://www.technocarb.com/natgasproperties.htm>